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TITLE: From EXOSAT to the High Energy Astrophysics Science Archive (HEASARC): X-ray Astronomy Comes of Age

Abstract (2,250 Maximum Characters): In May 1983 the European Space Agency launched EXOSAT, its first X-ray astronomy observatory. Even though it lasted only 3 short years, this mission brought not only new capabilities that resulted in unexpected discoveries, but also a pioneering approach to operations and archiving that changed X-ray astronomy from observations led by small instrument teams, to an observatory approach open to the entire community through a guest observer program. The community use of the observatory was supported by a small dedicated team of scientists, the precursor to the data center activities created to support e.g. Chandra and XMM-Newton. The new science capabilities of EXOSAT included a 90 hr highly eccentric high earth orbit that allow unprecedented continuous coverage of sources as well as direct communication with the satellite that allowed real time decisions to respond to unexpected events through targets of opportunity. The advantages of this orbit demonstrated by EXOSAT resulted in Chandra and XMM-Newton selecting similar orbits. The three instruments on board the EXOSAT observatory were complementary, designed to give complete coverage over a wide energy band pass of 0.05-50 keV. An onboard processor could be programed to give multiple data modes that could be optimized in response to science discoveries. These new capabilities resulted in many new discoveries including the first comprehensive study of AGN variability, new orbital periods in X-ray binaries and cataclysmic variables, new black holes, quasi-periodic oscillations from neutron stars and black holes and broad band X-ray spectroscopy. The EXOSAT team generated a well-organized database accessible worldwide over the nascent internet, allowing remote selection of data products, making samples and undertaking surveys from the data. The HEASARC was established by NASA at Goddard Space Flight Center in 1990 as the repository of NASA X-ray and Gamma-ray data. The proven EXOSAT database system became the core of the HEASARC infrastructure. The HEASARC pioneered many concepts now taken for granted including standardized formats using FITS files, restoring data from earlier missions, multi-mission analysis tools and a searchable archive over the world wide web.